D. Progress Report of Working Party 5: Economic Factors and Market Penetration

Throughout the fifth work period, the Working Party worked closely with the Systems Subcommittee Working Party 3, and four of the five meetings held were joint meetings with SS WP-3.

To meet the requirement to investigate the implications of ATV policy for industrial development and international trade, a Specialist Group was formed and led by Robert Crandall, a Senior Fellow of the Brookings Institute, who joined WP-5 for this purpose. A draft paper was prepared, and was submitted to the Chairman of the Planning Subcommittee and to the Chairman of the Advisory Committee Essentially the findings were that any policy to be established for ATV should not be different from any policies established for the development of U.S. industry and the encouragement of U.S. exports in the whole field of electronics and telecommunications. In fact, the objectives would be best served by the establishment of an ATV terrestrial broadcast standard at the earliest possible time, followed by the implementation of ATV service in the U.S. In particular, ATV offered excellent opportunities for U.S. employment in the production of ATV displays, which, because of their large size, would be manufactured in the U.S. Even today, almost all NTSC picture tubes of 25 inch diagonal or larger, are manufactured domestically.

While the paper sees little prospect for the mass export of ATV

receivers, the opportunity exists for the sale of patent licenses overseas, if the present advances in digital compression technology by U.S. companies can be sustained in the face of international competition.

In summary, no specific policy can, in the near term, enhance the U.S. position, except the active prosecution by the FCC in the selection of a terrestrial broadcasting standard, and the creation of a regulatory environment which will encourage the early implementation of ATV service in the U.S.

The main focus of the work of Working Party 5 has been, and continues to be, the refinement of the macro-economic projections for the adoption of ATV service, and specifically the rate at which ATV consumer equipment will penetrate the domestic market of television households.

The previous projections reported in the Fourth Interim Report have been widely, if somewhat intuitively, considered to be overly pessimistic. Indeed, a new assessment was clearly required to take account of the general shift to digital technology which calls for different equipment in the consumer's home. While the price of such equipment will initially be high, it is likely to fall very rapidly with the development of large scale integrated circuitry and the normal economies of scale.

In the development of the new penetration scenario, the following factors are held to be critical, and a range of assumptions are applied to each.

(i) Perceived Value

The perceived incremental value to the consumer of ATV service over the present NTSC service may be the same as the perceived incremental value of color TV over monochrome television thirty years ago. The assumptions made will include the views that the value is the same, and that it is considerably less than for the transition to color.

(ii) Price of Consumer Equipment

Detailed price estimates for consumer equipment are not yet available, but manufacturers' estimates have provided a useful starting point. A range of assumptions will be made for the introductory prices, possibly affected by forward pricing policies of the manufacturers. In any event, prices are assumed to fall rapidly from economies of scale and when improved design is effected, most notably by the introduction of LSI circuitry. The Working Party intends to solicit more detail from the ATV proponents on decoder complexity and cost to further refine its estimates.

(iii) Television Station Conversion Costs

The ability of stations to convert to ATV service in a timely manner will clearly influence the rate of penetration of service in the

consumer market. In 1990, WP-5 presented an initial scenario for the transition to ATV service by local stations. For full conversion to ATV service, the financial investment was daunting to many broadcasters. However, it is recognized that the investment required to effect the first phases of conversion, which would permit the pass-through and local retransmission of network or syndicator- delivered HDTV programming, will be reduced as equipment prices fall. From these and other considerations, a new transition scenario is being developed. This scenario will also take account of the impact of the FCC's recent Notice of Proposed Rule-making on the rate at which stations may start conversion. This, in turn, will affect the rate at which the consumer equipment market may grow.

(iv) The Impact of Cable, Home video, and Satellite Service. The opportunity exists for these alternative delivery media to start the penetration of the consumer market with ATV service at the time, or shortly after, the FCC establishes the ATV terrestrial transmission standard. While there is some doubt that cable systems would introduce ATV service before a local broadcast ATV service is in operation, it is noted that a limited inauguration of ATV cable service is planned for 1992.

Home video, on the other hand, operates as an independent program delivery service which could start at any time, and is constrained only by the need for the consumer to purchase an ATV display unit

in addition to the ATV player. Because the Home Video player is used largely with programming originally produced on high definition 35mm. film, a ready supply of programming is assured.

From these considerations, a range of assumptions concerning the timing and the rate of penetration of the ATV market will be developed.

(v) Funds for the Purchase of ATV Equipment.

Dependent on the perceived value to the consumer of ATV service and the other considerations listed above, assumptions will be made on the portion of discretionary funds available to the consumer and which are now applied to consumer electronics, that may be applied to the purchase of ATV home equipment.

E. Working Party 6: Subjective Assessment

Two tasks were being completed when the Fourth Interim Report was being prepared. These were the final verification of the multi-format telecine and the computer-based rendering of 10-second motion and still images by AT&T Bell Laboratories in four and five formats respectively. Both were completed on schedule and were delivered to ATTC.

On July 17, 1991, WP-6 held its only meeting to consider a request

by a proponent for additional subjective test material. It was agreed that a single format shoot of approximately one hour of several agreed-upon sports, would be a valuable addition to the existing test material, and should be completed in time to allow its use in evaluating the system selected for field tests. This work can only be done when the system or systems selected to undergo field testing are known, in order to limit any further costs.

F. Evaluation of Additional Proposed ATV Systems and Techniques

The Chairman of the Advisory Committee requested the Chairman of the Planning Subcommittee to monitor the emergence of any additional ATV system proposals other than those currently certified for testing.

The Chairman of the Planning Subcommittee requested Renville McMann, Chairman of PS WP-1, to survey and monitor the field, and to submit a report by the end of the first quarter of 1992. This has been done, and the report is presented in Section VIII.

In summary, in addition to the six ATV systems certified for testing, four proposals for systems or techniques have been investigated. They are:

(i) Compression using wavelets: Columbia University,

(ii) Compression using fractals: Georgia School of Technology and Iterated Systems Inc.,

(iii) Compression using vector quantization: Scientific Atlanta,

(iv) The E3TV system: Scabbard Corporation.

These proposals have been investigated in cooperation with Birney Dayton, Chairman of SS WP-1, and others.

Conclusions

None of the above proponents has advanced their system concepts to the point where they can be submitted to SS WP-1 for system analysis and test certification, nor have they been implemented in testable hardware. Of course, computer simulations of short sequences of picture material cannot be substituted for hardware capable of real-time ATV testing at the ATTC.

Thus as of today, no additional ATV systems are candidates for consideration in the current FCC ACATS ATV certification and test schedule.

V . FURTHER WORK

Most of the responsibilities assigned the Planning Subcommittee have been addressed and completed. Continuing assignments of work remain for Working Parties 3, 4, 5, and 6, as discussed below. The assignments to Working Parties 1 and 2 have been completed. They will, however, remain constituted on a stand-by basis, in case their expertise is called for in the course of the test program now under way at the ATTC.

A . Further Work of Working Party 3: Spectrum Utilization and Alternatives

The following work is scheduled for the sixth period.

(i) The most critical and pacing item of the remaining work is the timely completion and testing of the software for the interference and coverage computer program.

(ii) As soon as the test data is reported by the ATTC, and has been formatted and processed by the ATEL in Canada, initial test calculations will be made for NTSC systems and reports of ATV coverage, and accommodation statistics will be prepared as the test data becomes available. In addition to the laboratory test data, these

calculations will make use of the system-independent planning factors developed by WP-3. Preliminary results on the first systems should be available by June, 1992. The results of this work will be submitted to Systems Subcommittee Working Party 4 as a contribution to the overall assessment of each proponent system.

(vi) Continue to assist the FCC in active negotiations with Canada and Mexico on cross-border allotments of spectrum for ATV service.

(vii) The long-term (post-NTSC) spectrum efficiency of proponent systems will be studied, in case different systems could exhibit significant differences in maximum achievable service areas after NTSC restrictions are removed.

B. Further Work of Working Party 4: Alternative Media Technology and Broadcast Interface

The principal areas of future work are:

(i) Coordinate work on the development of headers and descriptors for image data. This has been done in cooperation with the SMPTE, through a PS WP-4 oversight liaison person.

(ii) Continue work on preparing definitions of some 21 terms that are important in discussions of "interoperability" as it affects ATV systems and all advanced image systems.

(iii) Analyze proponent systems for interoperability, extensibility, and scalability, considering alternative media and applications.

(iv) Define a hierarchical family of image data service levels.

(v) Support continued investigation of the EIA Multiport receiver/terminal concept, including the definition of a standard interface connector.

(vi) Study the benefits of asymmetric versus symmetric coding, based on spectrum efficiency, interoperability, extensibility, and scalability.

C. Further Work of Working Party 5: Economic Factors and Market Penetration

Working Party 5 will continue to develop a revised projection of the market penetration of ATV equipment, taking full account of the

contributions of the alternative delivery media, and of the impact of digital technology. WP-5 will continue to work jointly with SS WP-3 to determine the cost and complexity of each proponent's encoder, but will now extend the work to include the decoder in the consumer equipment, because the design of the proponents' decoder is likely to be a critical element in the total cost of the consumer equipment. Each proponent will be asked to present a full account of the complexity and the projected cost of the proposed decoder, at both the introductory stage and in full-scale manufacture

Working Party 5 will also develop a revised transition scenario for the conversion of local television stations to ATV service, recognizing the impact of the Commission's tentative Rule-making, and the interim techniques proposed for the early implementation of ATV service.

D. Further work of Working Party 6: Subjective Assessment

When the terminal phases of the ATTC laboratory tests are complete, WP-6 will prepare an hour-long subjective test material for use in the field tests.

VI . CONCLUSIONS AND RECOMMENDATIONS TO THE ADVISORY COMMITTEE

Outlined below are the conclusions and recommendations of the Working Parties and the recommendations of the Chairman of the Planning Subcommittee.

Working Party 3

Working Party 3 has concluded that the lack of spectrum for Broadcast Auxiliary Services in major markets may seriously impede the introduction of ATV service. The problem is discussed in depth in the report submitted to the Chairman of the Advisory Committee, and is appended to the WP-3 Chairman's Report in Section VII C.

The Chairman of the Planning Subcommittee recommends that the Advisory Committee and the FCC reconsider this issue, because of the danger that lack of Broadcast Auxiliary spectrum may delay the timely implementation of ATV service.

Working Party 4

Based on its study, with cross-industry participation, of interoperability, extensibility, and scalability, WP-4 recommends that headers and descriptors should be included as an essential part of all high resolution digital video data streams. This action will make interoperability, extensibility, and scalability effective in assuring that, in the future, ATV service may be readily integrated

with other distribution media and applications.

The Chairman of the Planning Subcommittee agrees with this recommendation, and has asked PS WP-4 to appoint a liaison person to coordinate the work on headers and descriptors now being performed by the SMPTE. In addition, the Chairman recommends that the WP-4 work on interoperability, extensibility, and scalability, continue under high priority to fully exploit the potential for the future integration of ATV service with other media and applications.

Working Party 5

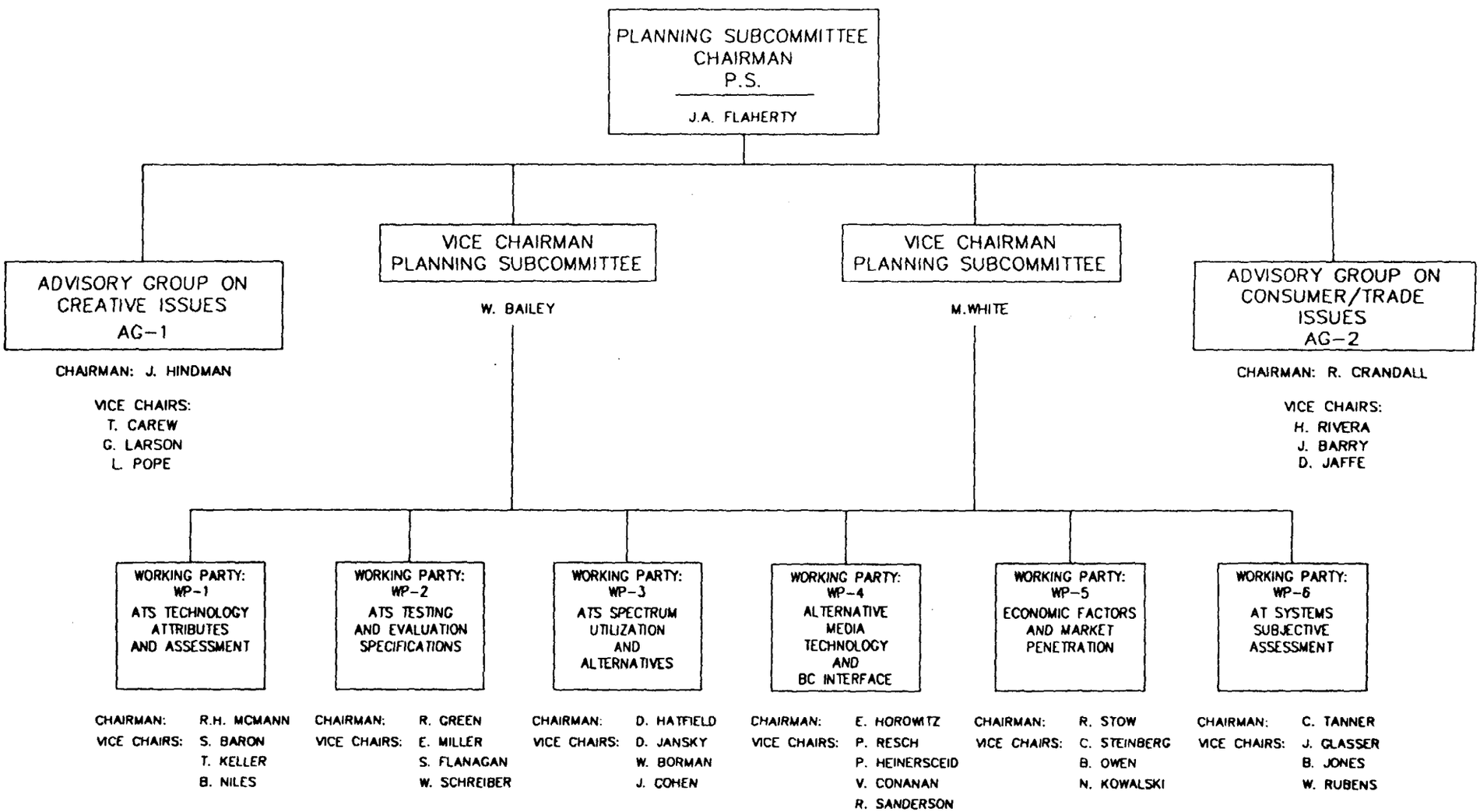
In order to compile an accurate economic asessment of the complexity and cost of the proponent systems in time for the Advisory Committee to make a recommendation on a proposed standard for ATV service, the Chairman has directed PS WP-5 to work in cooperation with SS WP-3 to make a thorough investigation of the cost and complexity of proposed signal decoders, in conjunction with their work on encoders.

VII. APPENDICES

A. Planning Subcommittee Organizational Chart

FEDERAL COMMUNICATIONS COMMISSION
ADVISORY COMMITTEE ON ADVANCED TELEVISION SERVICE

2/18/92



B. Chairmans Report: Working Parties 1 and 2

Renville H. McMann, Jr
963 Oenoke Ridge
New Canaan Ct. 06840

18 January, 1992

Chairman's Report PS/WP-1 (Technology Attributes and Assessment) and PS/WP-2 (Testing and Evaluation Specifications)

At the end of the last report period, PS/WP-1 and PS/WP-2, which had been meeting jointly, were put into a resting mode; therefore, there have been no formal meetings of these groups during the present report period. However, the chairman of PS/WP-1 and various members of both working parties have regularly attended meetings of SS/WP-1 (ATS Systems Analysis) and SS/WP-2 (System Analysis and Testing) in order to clarify any questions which might arise from interpretation of the Technical Attributes List orignally prepared by PS/WP-1. At these meetings, the chairman of PS/WP-1 expressed his concern that fundamental tests, previously agreed upon, not be deleted from the test program unless absolutely necessary to meeting schedule and financial requirements.

During the next report period, PS/WP-1 and PS/WP-2 will meet to ensure that certain system specific digital system tests now being proposed in SS/WP-2 are properly reflected in the Technical Attribute List

Respectfully submitted,

Chairman, PS/WP-1.

C Chairman's Report: Working Party 3

PS/WP-3-

FIFTH INTERIM REPORT OF THE

SPECTRUM UTILIZATION AND ALTERNATIVES WORKING PARTY

of the

PLANNING SUBCOMMITTEE

of the

ADVISORY COMMITTEE ON ADVANCED TELEVISION SERVICE

February 3, 1992

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I. EXECUTIVE SUMMARY AND RECOMMENDATIONS

This is the fifth interim report of the Spectrum Utilization and Alternatives Working Party (Working Party 3) of the Planning Subcommittee of the Federal Communications Commission's Advisory Committee on Advanced Television Service. As described in detail in earlier reports, Working Party 3 (PS/WP-3) was given primary responsibility for providing the Planning Subcommittee and, ultimately, via the Advisory Committee, the FCC with advice concerning spectrum utilization and alternatives as related to the Advanced Television Service (ATS). Since its inception, the Working Party has met a total of 45 times, and the meetings continue to be well attended. The purpose of this section of the report is to summarize the results of the Working Party's activities since the last report, and to set forth certain recommendations that have resulted from those activities.

As previously reported, the Working Party organized itself into specialist groups in order to effectively carry out its work. These specialist groups and their respective responsibilities were identified and described in earlier reports, and the descriptions will not be repeated here. Two significant organizational developments occurred during the period. First, a new specialist group (Specialist Group 11) was formed and charged with developing a methodology and supporting computer model for evaluating the coverage and interference characteristics of proposed ATV transmission systems. Second, the Working Party received a letter from the Chairman of SS/WP-4 asking for a member of WP-3 to be appointed as an official liaison between the two working parties. Accordingly,

a delegate and alternate were appointed to represent PS/WP-3 on the Task Force on Report Drafting, and they have made contributions to that important activity.

Specialist Group 3, the specialist group charged with analyzing the impact of ATV on spectrum requirements for broadcast Auxiliary Services, and the entire Working Party are well aware of the Commission's tentative decision, in its October 24, 1991, Notice of Proposed Rulemaking, that no additional spectrum should be made available for auxiliary broadcast use. This decision was apparently taken in the belief that ATV licensees will be able to utilize digital compression techniques and fiber optic links instead of additional spectrum for critical Studio-to-Transmitter Links (STLs) and other auxiliary circuits. However, the Working Party has taken explicit account of these alternatives in its analyses and has concluded that it is unlikely that compression techniques and fiber optic systems will be able to accommodate the additional demand in the larger broadcast markets. This is especially true in light of the Commission's suggestion that some separate ATV and NTSC programming may be authorized. Hence, PS/WP-3 has concluded that consideration must be given to the need for auxiliary spectrum for STL and, perhaps, Satellite Entrance Link use, at least during a transition period. Moreover, it is the Working Party's considered opinion that further sharing of the existing broadcast auxiliary spectrum could impede the implementation of ATV and disrupt current methods of electronic news gathering (ENG).

For these reasons, the Working Party recommends that:

1. The FCC institute a dialogue with the National Telecommunications and Information Administration (NTIA) to consider the availability of additional shared spectrum to accommodate these critical needs.

2. The Congress, the FCC, and the NTIA consider the needs of the new ATV service in the pending legislation that would transfer 200 MHz of additional spectrum to the private sector.

3. Particular attention be given to the bands 4.40 - 4.99 GHz and 7.75 - 7.90 GHz which the Working Party believes represent the best possibilities for providing additional broadcast auxiliary spectrum on a shared government/non-government basis.

4. Tighter coordination of existing auxiliary spectrum be required and the use of more spectrally efficient techniques for the broadcast support spectrum be encouraged.

5. The FCC be sensitive to the cost of fiber optic technology in its consideration of the suitability of that technology for satisfying the need for expanded broadcast auxiliary services.

Specialist Group 4, the specialist group charged with studying the possibility of the terrestrial broadcasting of ATV in the spectrum above 1 GHz, has remained inactive for the reasons specified in earlier reports. The work of Specialist Groups 6, Spectrum Analysis, and 7, Taboos, has been combined. Since the Fourth Interim Report, this combined effort has concentrated on preparing for the time when reports are available disclosing the results of both objective and subjective tests being conducted by laboratories in the United States and Canada. At that time, reports on ATV coverage and accommodation statistics will be prepared on a system-by-system basis, utilizing the planning factors specified by Specialist Group 10 and the computer program currently being developed under the guidance of Specialist Group 11, and with the

support of the Broadcasters' Caucus of the Advanced Television Systems Committee.

Specialist Group 9 was tasked with considering cross-border issues. Between the combined efforts of the Commission and the Working Party, it now appears that a basis for good cooperation with Canada has been established. Specialist Group 9 will continue to coordinate the work of PS/WP-3 with Canada and Mexico as appropriate. Specialist Group 10 of the Working Party was charged with determining suitable ATV planning factors. Since interference characteristics will vary from system to system, and since these interference performance data have not been available pending completion of the laboratory tests, this Specialist Group has concentrated its attention on the system-independent planning factors and ATV spectrum allotment/assignment principles. Based upon its activities to date, Working Party 3 makes the following three recommendations with regard to system-independent planning factors, antenna standards, and ATV spectrum allotment/assignment plan principles:

1. System Independent Planning Factors

PS/WP-3 recommends that the System-Independent Planning Factors found in the table contained herein be used in connection with the development of service coverage prediction and allotment/ assignment plans.

2. Antenna Standard

As closer co-channel mileage separations could be required to accommodate all or nearly all existing stations with a 6 MHz simulcast channel, PS/WP-3 recommends the development of a voluntary,